



# Hop River

## Watershed Summary

### WATERSHED DESCRIPTION AND MAPS

The Hop River watershed covers an area of approximately 26,707 acres in the mid-eastern area of Connecticut (Figure 1). The Hop River watershed is located at least partially in the municipalities of Bolton, Coventry, Andover, Columbia, Hebron, Vernon, and Tolland, CT.

The entire length of the Hop River is impaired for recreation due to elevated bacteria levels (CT3108-00\_01b). This river was assessed by Connecticut Department of Energy and Environmental Protection (CT DEEP) and included in the CT 2010 303(d) list of impaired waterbodies. An excerpt of the Integrated Water Quality Report is included in Table 1 to show the status of waterbodies in the watershed (CTDEEP, 2010).

The Hop River begins in Bolton upstream of the intersection of Stony Road and US Route 6, continues southeasterly crossing US Route 6 several times, crosses the Andover border, follows the Coventry-Andover border, and ends at the confluence with the Skungamaug River just upstream of the Hendee Road crossing east of US Route 6 in Andover.

The Hop River has a water quality classification of A. Designated uses include potential drinking water supplies, habitat for fish and other aquatic life and wildlife, recreation, navigation, and industrial and agricultural water supply. The Hop River is impaired due to elevated bacteria concentrations, affecting the designated use of recreation. As there are no designated beaches in the Hop River, the specific recreation impairment is for non-designated swimming and other water contact related activities.

### Impaired Segment Facts

#### **Impaired Segment:**

Hop River (CT3108-00\_01b)

#### **Municipalities:**

Andover, Coventry, Bolton

#### **Impaired Segment Length (miles):**

3.22

#### **Water Quality Classifications:**

Class A

#### **Designated Use Impairments:**

Recreation

#### **Sub-regional Basin Name and**

**Code:** Hop River, 3108

**Regional Basin:** Willimantic

**Major Basin:** Thames

**Watershed Area (acres):** 26,707

**MS4 Applicable?** Yes

**Applicable Season:** Recreation  
Season (May 1 to September 30)

**Figure 1: Watershed location in Connecticut**

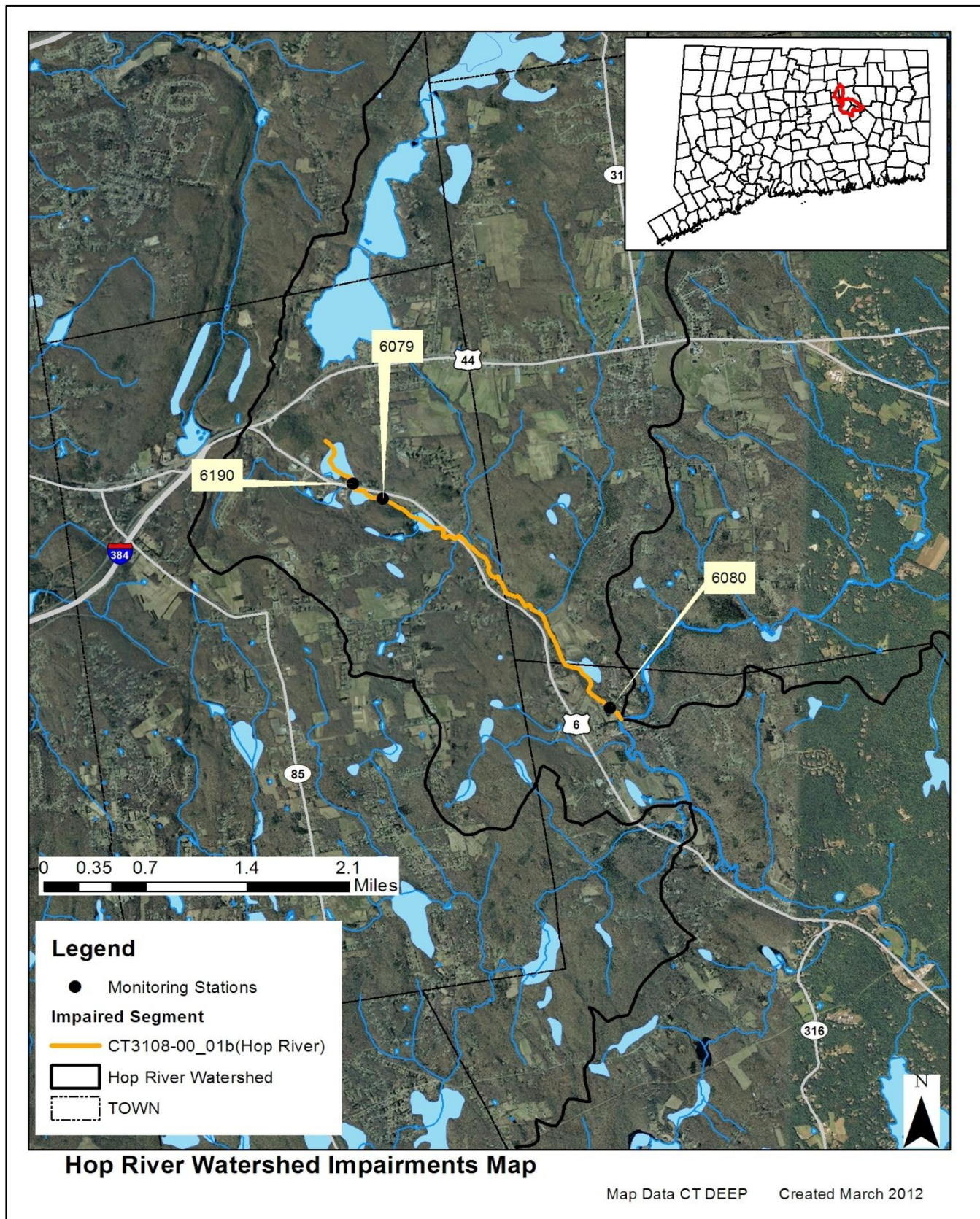


**Table 1: Impaired segments and nearby waterbodies from the Connecticut 2010 Integrated Water Quality Report**

<b>Waterbody ID</b>	<b>Waterbody Name</b>	<b>Location</b>	<b>Miles</b>	<b>Aquatic Life</b>	<b>Recreation</b>	<b>Fish Consumption</b>
CT3108-00_01b	Hop River (Andover/Coventry/ Bolton)-01b	Confluence with Skungamaug River, just US of Hendee Road crossing (east of Route 6), Andover, US to HW behind Munsons Chocolate Company (crosses Route 6 several times, last time is near Stony Road intersection), Bolton.	3.22	FULL	NOT	FULL
<b>Shaded cells indicate impaired segment addressed in this TMDL</b> <b>FULL = Designated Use Fully Supported</b> <b>NOT = Designated Use Not Supported</b> <b>U = Unassessed</b>						



Figure 2: GIS map featuring general information of the Hop River watershed at the sub-regional level (the location and name of each sampling station is indicated on the impaired segment)



### *Land Use*

Existing land use can affect the water quality of waterbodies within a watershed (USEPA, 2011c). Natural processes, such as soil infiltration of stormwater and plant uptake of water and nutrients, can occur in undeveloped portions of the watershed. As impervious surfaces (such as rooftops, roads, and sidewalks) increase within the watershed landscape from commercial, residential, and industrial development, the amount of stormwater runoff to waterbodies also increases. These waterbodies are negatively affected as increased pollutants from failing and insufficient septic systems, oil and grease from automobiles, and sediment from construction activities become entrained in this runoff. Agricultural land use activities, such as fertilizer application and manure from livestock, can also increase pollutants in nearby waterbodies (USEPA, 2011c).

As shown in Figures 3 and 4, the Hop River watershed consists of 66% forest, 16% urban, 11% agriculture, and 7% water. The Hop River flows through predominantly wooded areas, particularly through the Hop River State Park, but flows parallel to commercial and residential development along US Route 6. The Hop River also passes near several agricultural fields, including hayfields, particularly along Times Farm Road in the downstream portion of the impaired river.

**Figure 3: Land use within the Hop River watershed**

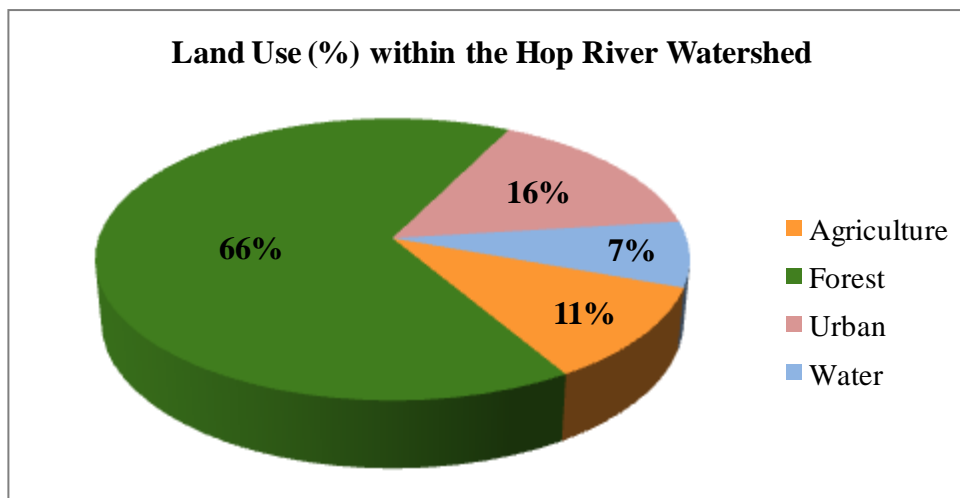
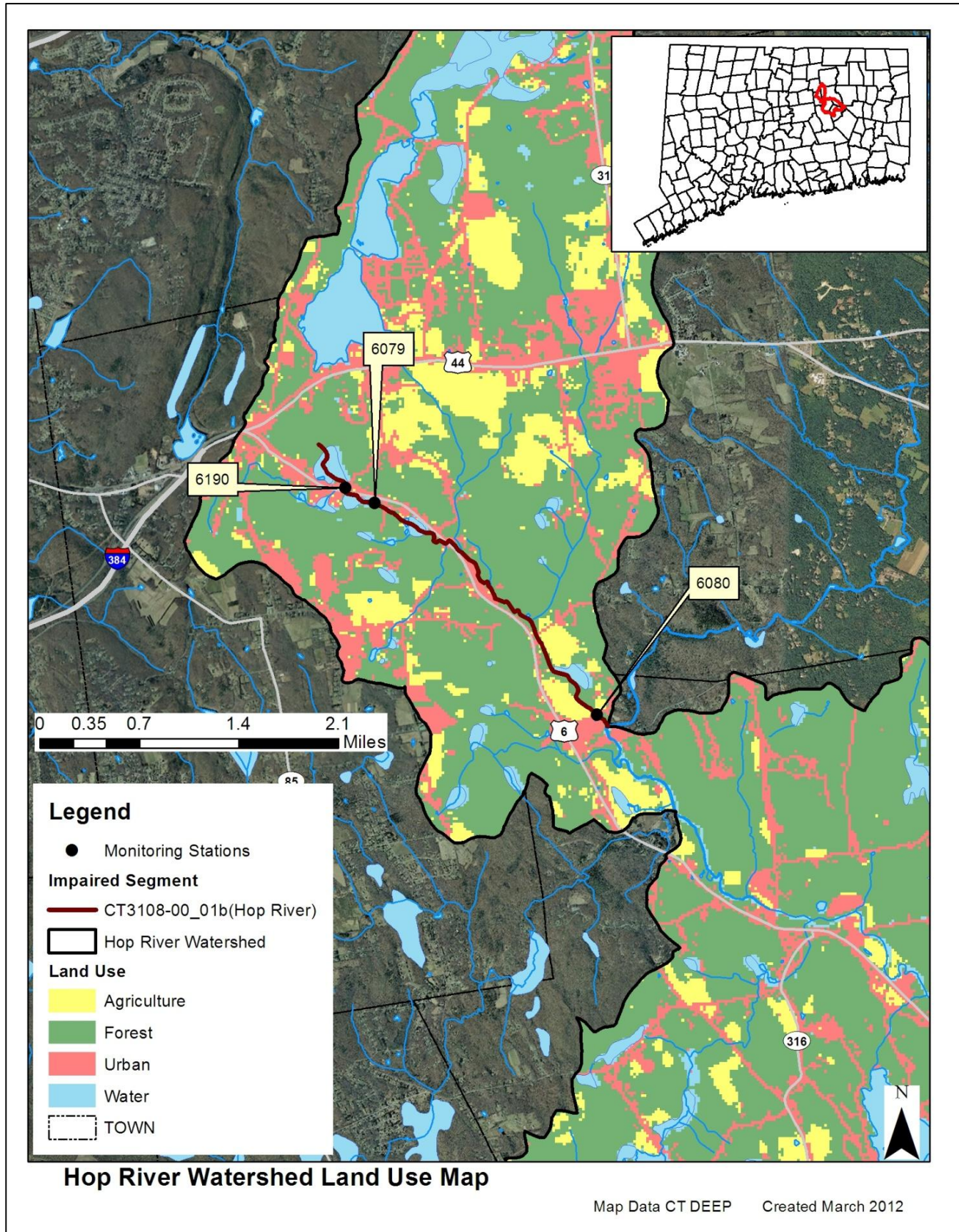




Figure 4: GIS map featuring land use for the Hop River watershed at the sub-regional level



**WHY IS A TMDL NEEDED?**

*E. coli* is the indicator bacteria used for comparison with the CT State criteria in the CT Water Quality Standards (WQS) (CTDEEP, 2011). All data results are from CT DEEP, USGS, Bureau of Aquaculture, or volunteer monitoring efforts at stations located on the impaired river.

**Table 2: Sampling station location description for the impaired segment in the Hop River watershed (stations organized downstream to upstream)**

Waterbody ID	Waterbody Name	Station	Station Description	Municipality	Latitude	Longitude
CT3108-00_01b	Hop River	6080	At Times Farm Road crossing	Andover	41.76066	-72.39776
		6079	Above Johnson Pond adjacent to Johnson Road and Route 6	Bolton	41.78236	-72.42792
		6190	Route 6 crossing adjacent to Stony Road	Bolton	41.78391	-72.431951

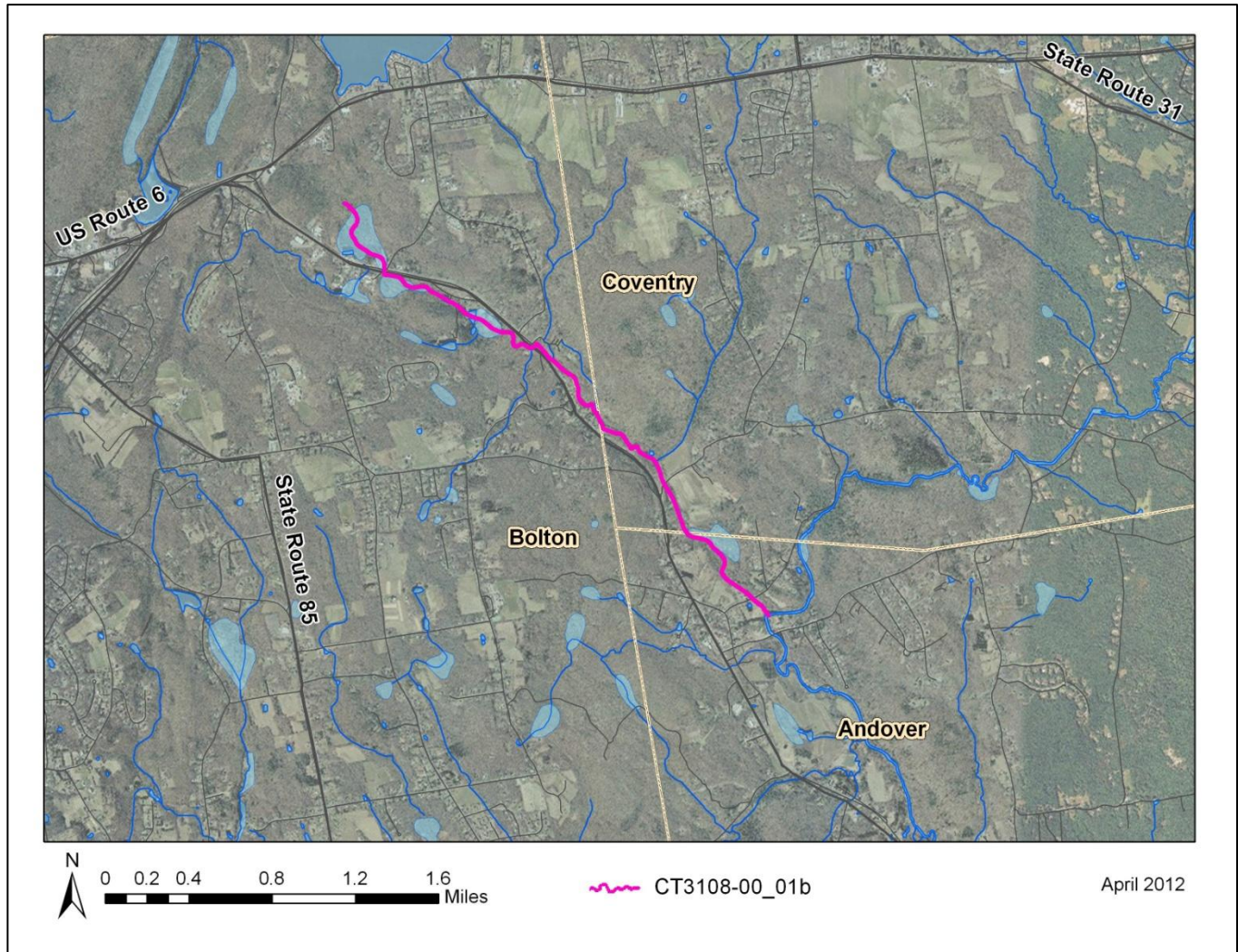
The Hop River (CT3108-00\_01b) is a Class A freshwater river (Figure 5). Its applicable designated uses are potential drinking water supplies, habitat for fish and other aquatic life and wildlife, recreation, navigation, and industrial and agricultural water supply. Water quality analyses were conducted using data from three sampling locations in 2010 (Table 2). To aid in identifying possible bacteria sources, the geometric mean was also calculated for all stations for wet-weather and dry-weather sampling days, where possible (Table 9).

As shown in Table 9, geometric mean and single sample values exceeded the WQS for *E. coli* at Station 6080. Geometric mean values also exceeded the WQS for *E. coli* at Station 6080 during both wet and dry-weather.

Due to the elevated bacteria measurements presented in Table 9, this impaired segment does not meet CT's bacteria WQS, was identified as impaired, and was placed on the CT List of Waterbodies Not Meeting Water Quality Standards, also known as the CT 303(d) Impaired Waters List. The Clean Water Act requires that all 303(d) listed waters undergo a TMDL assessment that describes the impairments and identifies the measures needed to restore water quality. The goal is for all waterbodies to comply with State WQS.



Figure 5: Aerial map of the Hop River watershed



**POTENTIAL BACTERIA SOURCES**

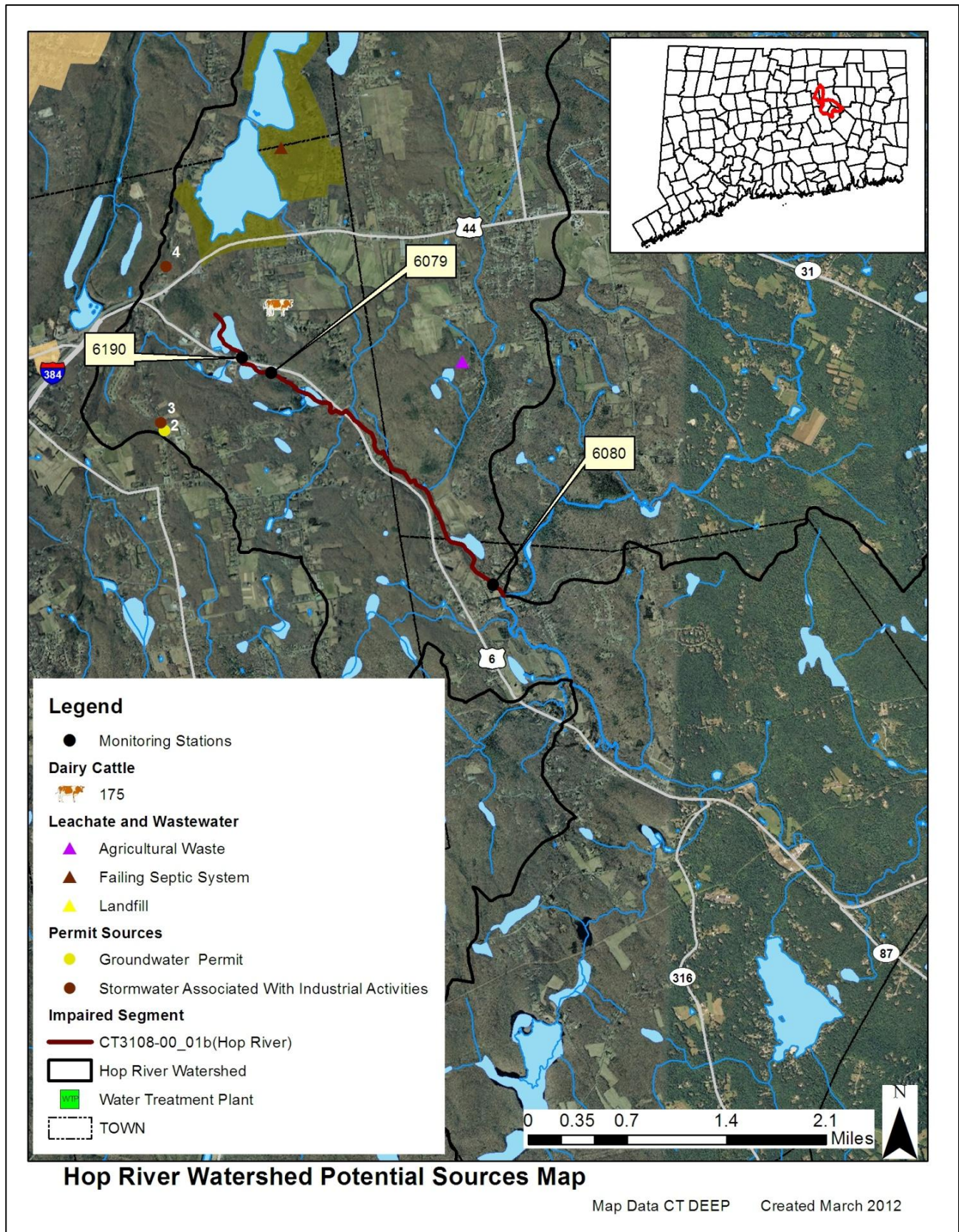
Potential sources of indicator bacteria in a watershed include point and non-point sources, such as stormwater runoff, agriculture, sanitary sewer overflows (collection system failures), illicit discharges, and inappropriate discharges to the waterbody. Potential sources that have been tentatively identified in the Hop River watershed based on land use (Figures 3 and 4) and a collection of local information for each of the waterbodies is presented in Table 3 and Figure 9. However, the list of potential sources is general in nature and should not be considered comprehensive. There may be other sources not listed here that contribute to the observed water quality impairment in the study segment. Further monitoring and investigation will confirm listed sources and discover additional ones. For some segments, there are data from permitted sources, and CT DEEP recommends that any elevated concentrations found from those permitted sources be addressed through voluntary reduction measures. More detailed evaluation of potential sources is expected to become available as activities are conducted to implement these TMDLs.

**Table 3: Potential bacteria sources in the Hop River watershed**

<b>Impaired Segment</b>	<b>Permit Source</b>	<b>Illicit Discharge</b>	<b>CSO/SSO Issue</b>	<b>Failing Septic System</b>	<b>Agricultural Activity</b>	<b>Stormwater Runoff</b>	<b>Nuisance Wildlife/Pets</b>	<b>Other</b>
Hop River CT7200-00_01	<b>x</b>			<b>x</b>	<b>x</b>	<b>x</b>	<b>x</b>	



Figure 6: Potential sources in the Hop River watershed at the sub-regional level



The potential sources map for the impaired basin was developed after thorough analysis of available data sets. If information is not displayed in the map, then no sources were discovered during the analysis. The following is the list of potential sources that were evaluated: problems with migratory waterfowl, golf course locations, reservoirs, proposed and existing sewer service, cattle farms, poultry farms, permitted sources of bacteria loading (surface water discharge, MS4 permit, industrial stormwater, commercial stormwater, groundwater permits, and construction related stormwater), and leachate and discharge sources (agricultural waste, CSOs, failing septic systems, landfills, large septic tank leach fields, septage lagoons, sewage treatment plants, and water treatment or filter backwash).

### **Point Sources**

Permitted sources within the watershed that could potentially contribute to the bacteria loading are identified in Table 4. This table includes permit types that may or may not be present in the impaired watershed. Additional investigation and monitoring could reveal the presence of additional discharges in the watershed. Available effluent data from each of these permitted categories found within the watershed are compared to the CT State WQS for the appropriate receiving waterbody use and type.

**Table 4: General categories list of other permitted discharges**

Permit Code	Permit Description Type	Number in watershed
CT	Surface Water Discharges	0
GPL	Discharge of Swimming Pool Wastewater	0
GSC	Stormwater Discharge Associated with Commercial Activity	0
GSI	Stormwater Associated with Industrial Activity	3
GSM	Part B Municipal Stormwater MS4	0
GSN	Stormwater Registration – Construction	0
LF	Groundwater Permit (Landfill)	1
UI	Underground Injection	0

### ***Permitted Sources***

As shown in Table 5, there are multiple permitted discharges in the Hop River watershed. Bacteria data were not available for the industrial permitted facilities. Since the MS4 permits are not targeted to a specific location, but the geographic area of the regulated municipality, there is no one accurate location on the map to display the location of these permits. One dot will be displayed at the geographic center of the municipality as a reference point. Sometimes this location falls outside of the targeted watershed and therefore the MS4 permit will not be displayed in the Potential Sources Map. Using the municipal border as a guideline will show which areas of an affected watershed are covered by an MS4 permit. Besides the municipal stormwater sources described below, there are no known permitted discharge points in the Latimer Brook watershed.

**Table 5: Permitted facilities within the Hop River watershed**

<b>Town</b>	<b>Client</b>	<b>Permit ID</b>	<b>Permit Type</b>	<b>Site Name</b>	<b>Map #</b>
Columbia	Town of Columbia	GSI001300	Stormwater Associated With Industrial Activities	Public Works Garage/Transfer Station	1
Bolton	Hathaway Sand & Gravel , Llc	GSI002075	Stormwater Associated With Industrial Activities	Hathaway Sand & Gravel , Llc	4
Bolton	Town of Bolton	GSI002145	Stormwater Associated With Industrial Activities	Public Works Facility	3
Bolton	Town of Bolton	GSM000104	Part B Municipal Stormwater MS4	Bolton, Town of	NA
Bolton	Town of Bolton	UI0000270	Groundwater Permit	Bolton Center School	2

***Municipal Stormwater Permitted Sources***

Per the EPA Phase II Stormwater rule all municipal storm sewer systems (MS4s) operators located within US Census Bureau Urbanized Areas (UAs) must be covered under MS4 permits regulated by the appropriate State agency. There is an EPA waiver process that municipalities can apply for to not participate in the MS4 program. In Connecticut, EPA has granted such waivers to 19 municipalities. All participating municipalities within UAs in Connecticut are currently regulated under MS4 permits by CT DEEP staff in the MS4 program.

The US Census Bureau defines a UA as a densely settled area that has a census population of at least 50,000. A UA generally consists of a geographic core of block groups or blocks that exceeds the 50,000 people threshold and has a population density of at least 1,000 people per square mile. The UA will also include adjacent block groups and blocks with at least 500 people per square mile. A UA consists of all or part of one or more incorporated places and/or census designated places, and may include additional territory outside of any place. (67 FR 11663)

For the 2000 Census a new geographic entity was created to supplement the UA blocks of land. This created a block known as an Urban Cluster (UC) and is slightly different than the UA. The definition of a UC is a densely settled area that has a census population of 2,500 to 49,999. A UC generally consists of a geographic core of block groups or blocks that have a population density of at least 1,000 people per square mile, and adjacent block groups and blocks with at least 500 people per square mile. A UC consists of all or part of one or more incorporated places and/or census designated places; such a place(s) together with adjacent territory; or territory outside of any place. The major difference is the total population cap of 49,999 people for a UC compared to >50,000 people for a UA. (67 FR 11663)

While it is possible that CT DEEP will be expanding the reach of the MS4 program to include UC municipalities in the near future they are not currently under the permit. However, the GIS layers used to create the MS4 maps in this Statewide TMDL did include both UA and UC blocks. This factor creates some municipalities that appear to be within an MS4 program that are not currently regulated through an MS4 permit. This oversight can explain a municipality that is at least partially shaded grey in the maps and there are no active MS4 reporting materials or information included in the appropriate appendix. While these areas are not technically in the MS4 permit program, they are still considered urban by the cluster definition above and are likely to contribute similar stormwater discharges to affected waterbodies covered in this TMDL.



As previously noted, EPA can grant a waiver to a municipality to preclude their inclusion in the MS4 permit program. One reason a waiver could be granted is a municipality with a total population less than 1000 people, even if the municipality was located in a UA. There are 19 municipalities in Connecticut that have received waivers, this list is: Andover, Bozrah, Canterbury, Coventry, East Hampton, Franklin, Haddam, Killingworth, Litchfield, Lyme, New Hartford, Plainfield, Preston, Salem, Sherman, Sprague, Stafford, Washington, and Woodstock. There will be no MS4 reporting documents from these towns even if they are displayed in an MS4 area in the maps of this document.

The list of US Census UCs is defined by geographic regions and is named for those regions, not necessarily by following municipal borders. In Connecticut the list of UCs includes blocks in the following Census Bureau regions: Colchester, Danielson, Lake Pocotopaug, Plainfield, Stafford, Storrs, Torrington, Willimantic, Winsted, and the border area with Westerly, RI (67 FR 11663). Any MS4 maps showing these municipalities may show grey areas that are not currently regulated by the CT DEEP MS4 permit program.

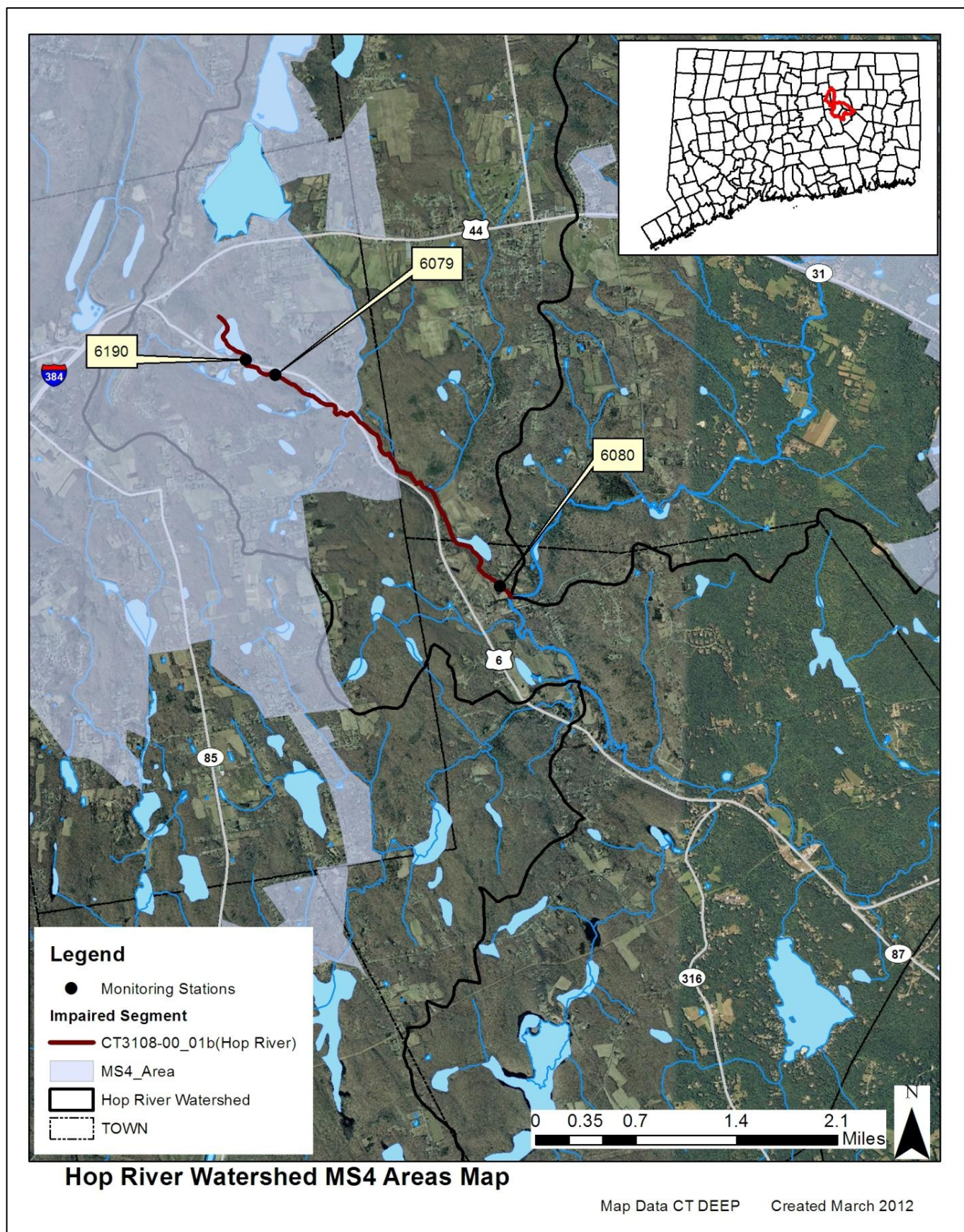
The impaired segment of the Hop River watershed is located within the Towns of Bolton, Coventry, and Andover, CT. Bolton is largely urbanized, as defined by the U.S. Census Bureau, and is required to comply with the General Permit for the Discharge of Stormwater from Small Municipal Storm Sewer Systems (MS4 permit) issued by the Connecticut Department of Energy and Environmental Protection (DEEP) (Figure 7). This general permit is only applicable to municipalities that are identified in Appendix A of the MS4 permit that contain designated urban areas and discharge stormwater via a separate storm sewer system to surface waters of the State. The permit requires municipalities to develop a Stormwater Management Plan (SMP) to reduce the discharge of pollutants and protect water quality. The MS4 permit is discussed further in the “TMDL Implementation Guidance” section of the core TMDL document. Additional information regarding stormwater management and the MS4 permit can be obtained on CTDEEP’s website ([http://www.ct.gov/dep/cwp/view.asp?a=2721&q=325702&depNav\\_GID=1654](http://www.ct.gov/dep/cwp/view.asp?a=2721&q=325702&depNav_GID=1654)).

Multiple MS4 outfalls have been sampled for *E. coli* bacteria in the watershed (Table 6). In Bolton, four MS4 outfalls were sampled from 2006 – 2011. All four outfalls exceeded the single sample water quality standard of 410 colonies/100 mL on at least one sample date with particularly high counts at Station C-2.

**Table 6: List of MS4 sample locations and *E. coli* (colonies/100 mL) results in the Hop River watershed**

<b>Town</b>	<b>Location</b>	<b>MS4 Type</b>	<b>Receiving Waters</b>	<b>Sample Date</b>	<b>Result</b>
Bolton	C-1	Commercial	Hop River	12/01/06	50
Bolton	C-1	Commercial	Hop River	08/21/07	300
Bolton	C-1	Commercial	Hop River	09/11/07	380
Bolton	C-1	Commercial	Hop River	01/11/08	20
Bolton	C-1	Commercial	Hop River	06/09/09	2,250
Bolton	C-1	Commercial	Hop River	09/23/11	310
Bolton	C-2	Commercial	Hop River	12/01/06	450
Bolton	C-2	Commercial	Hop River	08/21/07	20,000
Bolton	C-2	Commercial	Hop River	09/11/07	2,000
Bolton	C-2	Commercial	Hop River	01/11/08	760
Bolton	C-2	Commercial	Hop River	06/09/09	15,530
Bolton	C-2	Commercial	Hop River	09/23/11	9,800
Bolton	I-1	Industrial	Hop River	12/01/06	600
Bolton	I-1	Industrial	Hop River	08/21/07	100
Bolton	I-1	Industrial	Hop River	09/11/07	2,000
Bolton	I-1	Industrial	Hop River	01/11/08	140
Bolton	I-1	Industrial	Hop River	06/09/09	1,660
Bolton	I-1	Industrial	Hop River	09/23/11	1,020
Bolton	R-2	Residential	Hop River	12/01/06	10
Bolton	R-2	Residential	Hop River	08/21/07	1,000
Bolton	R-2	Residential	Hop River	09/11/07	100
Bolton	R-2	Residential	Hop River	01/11/08	180
Bolton	R-2	Residential	Hop River	06/09/09	5
Bolton	R-2	Residential	Hop River	09/23/11	5
<b>Shaded cells indicate an exceedance of single-sample based water quality criteria (410 colonies/100 mL)</b>					

Figure 7: MS4 areas of the Hop River watershed





### ***Publicly Owned Treatment Works***

As shown in Figure 7, there are no publicly owned treatment works (POTWs), or wastewater treatment plants, in the Hop River watershed, and therefore, POTWS are not a potential source of bacterial contamination.

### **Non-point Sources**

Non-point source pollution (NPS) comes from many diffuse sources and is more difficult to identify and control. NPS pollution is often associated with land-use practices. Examples of NPS that can contribute bacteria to surface waters include insufficient septic systems, pet and wildlife waste, agriculture, and contact recreation (swimming or wading). Potential sources of NPS within the Hop River watershed are described below.

### ***Wildlife and Domestic Animal Waste***

Wildlife and domestic animals within the Hop River watershed represent a potential source of bacteria to the impaired waterbody. Elevated bacteria levels that are due solely to a natural population of wildlife are not subject to the WQS. Any exacerbation of wildlife population sizes or residency times influenced by human activities is subject to the CT WQS and TMDL provisions. With the construction of roads and drainage systems, wildlife waste may no longer be retained on the landscape, but instead may be conveyed via stormwater to the nearest surface waterbody. As such, these physical land alterations can exacerbate the impact of natural sources on water quality (USEPA, 2001). As the majority of the watershed is undeveloped, wildlife waste is a potential source of bacteria in the Hop River watershed.

There are several areas in the Hop River watershed where open spaces or recreational land is adjacent to or near the water. Geese and other waterfowl are known to congregate in open areas including recreational fields, agricultural crop fields, and golf courses. In addition to creating a nuisance, large numbers of geese can also create unsanitary conditions on the grassed areas and cause water quality problems due to bacterial contamination associated with their droppings. Large populations of geese can lead to habitat destruction as a result of overgrazing on wetland and riparian plants.

Much of the residential development in the watershed is located near the impaired segment of the Hop River, particularly along US Route 6. Pet waste may also be contributing to bacterial concentrations in the Hop River either from neighborhoods or nearby open spaces, which are popular destinations for pets and their owners.

### ***Agricultural Activities***

Agricultural operations are an important economic activity and landscape feature in many areas of the State. Runoff from agricultural fields may contain pollutants such as bacteria and nutrients (USEPA, 2011a). There are small farms and agricultural fields scattered throughout the Hop River watershed, some of which are adjacent to the Hop River (Figure 4). A dairy farm with 175 cattle and an agricultural waste site were identified in Figure 6 near the upstream reaches of the Hop River and along Ash Brook, a tributary to the Hop River, respectively. Agricultural runoff from these farms and others in the area is a potential source of bacteria to the Hop River.

***Insufficient Septic Systems and Illicit Discharges***

As shown in Figure 6, the area surrounding the impaired segment of the Hop River watershed relies on onsite wastewater treatment systems, such as septic systems. Properly managed septic systems and leach fields have the ability to effectively remove bacteria from waste. If systems are not maintained, waste will not be adequately treated and may result in bacteria reaching nearby surface and ground water. In Connecticut, local health directors or health districts are responsible for keeping track of any reported insufficient or failing septic systems in a specific municipality. Bolton, Coventry, and Andover are part of the Eastern Highlands health district (<http://www.ehhd.org>).

***Stormwater Runoff from Developed Areas***

Urban areas are often characterized by impervious cover, or surface areas such as roofs and roads that force water to run off land surfaces rather than infiltrate the soil. Studies have shown a link between the amount of impervious area and water quality conditions in a watershed (CWP, 2003). In one study, researchers correlated the amount of fecal coliform to the percent of impervious cover (Mallin *et al.*, 2000). Although the majority of the Hop River watershed is undeveloped with only 0-6% impervious surfaces, approximately 16% of the watershed is considered urban, and this area is concentrated around the impaired segment along the commercial and residential development of US Route 6 (Figures 4, 8, and 9). As shown in Table 9, geometric mean values for wet-weather exceeded the WQS for *E. coli* at Station 6080 along the downstream portion of the Hop River. As such, stormwater runoff is a likely source of bacterial contamination to the Hop River.

**Figure 8: Range of impervious cover (%) in the Hop River watershed**

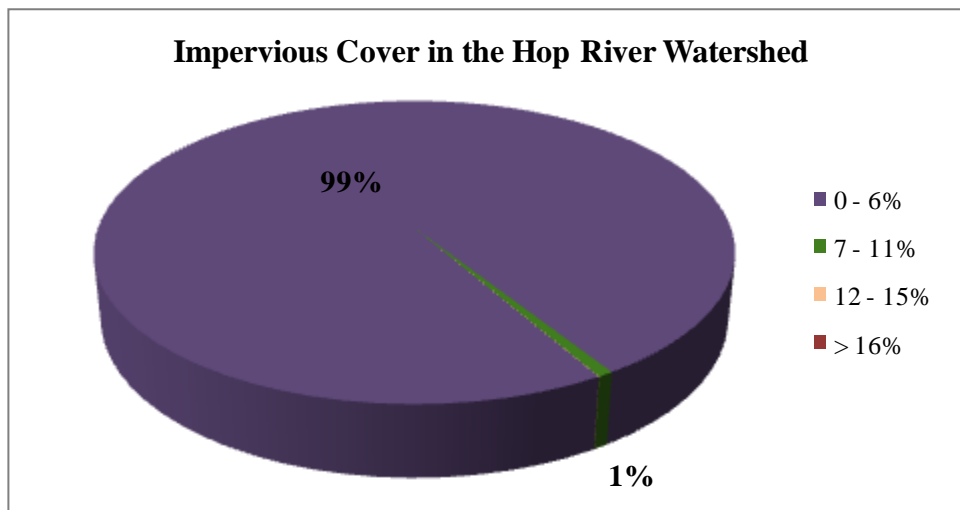
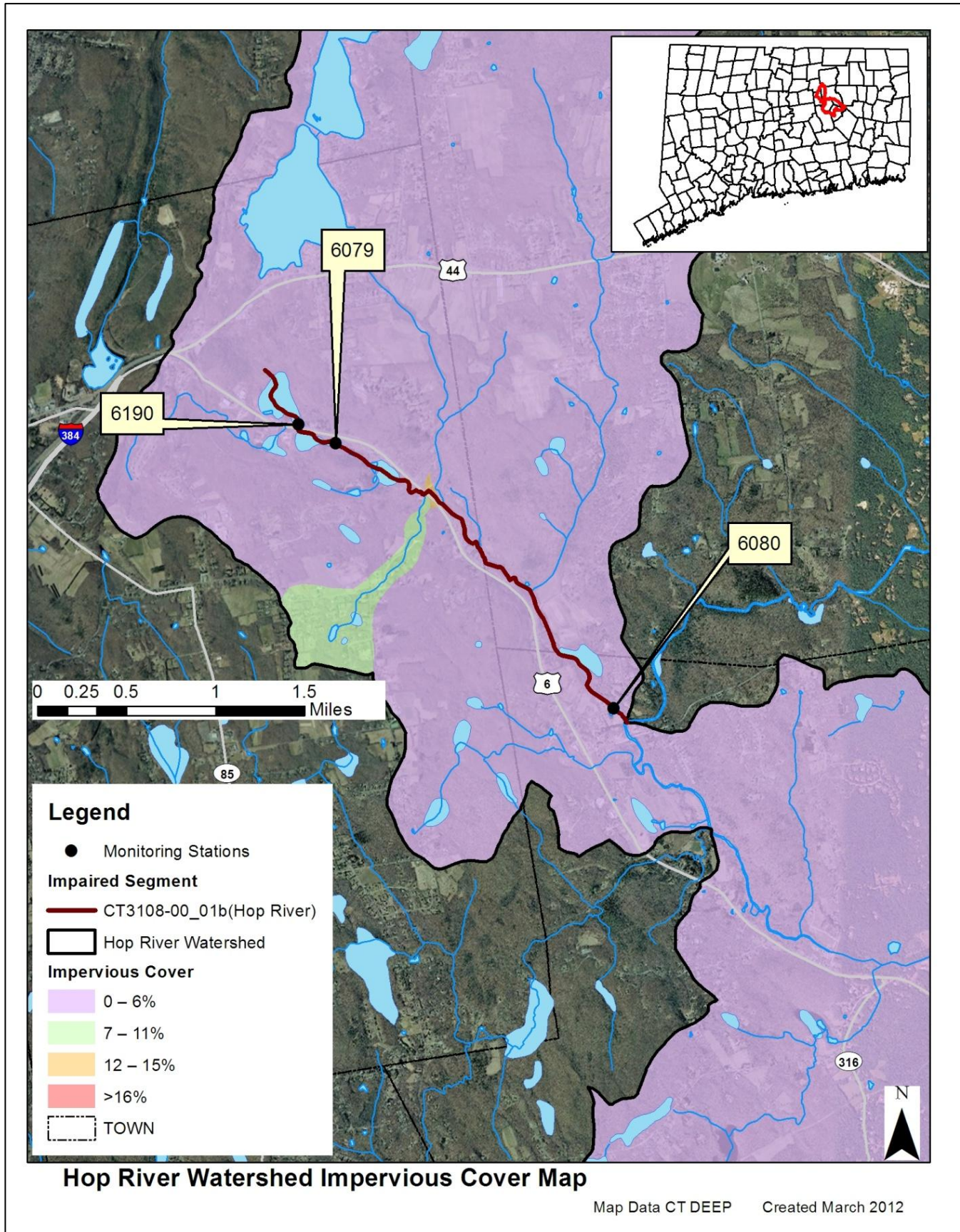


Figure 9: Impervious cover (%) for the Hop River sub-regional watershed





**Additional Sources**

There may be other sources not listed here or identified in Figure 6 that contribute to the observed water quality impairment in the Hop River watershed. Further monitoring and investigation will confirm the listed sources and discover additional ones. More detailed evaluation of potential sources is expected to become available as activities are conducted to implement this TMDL.

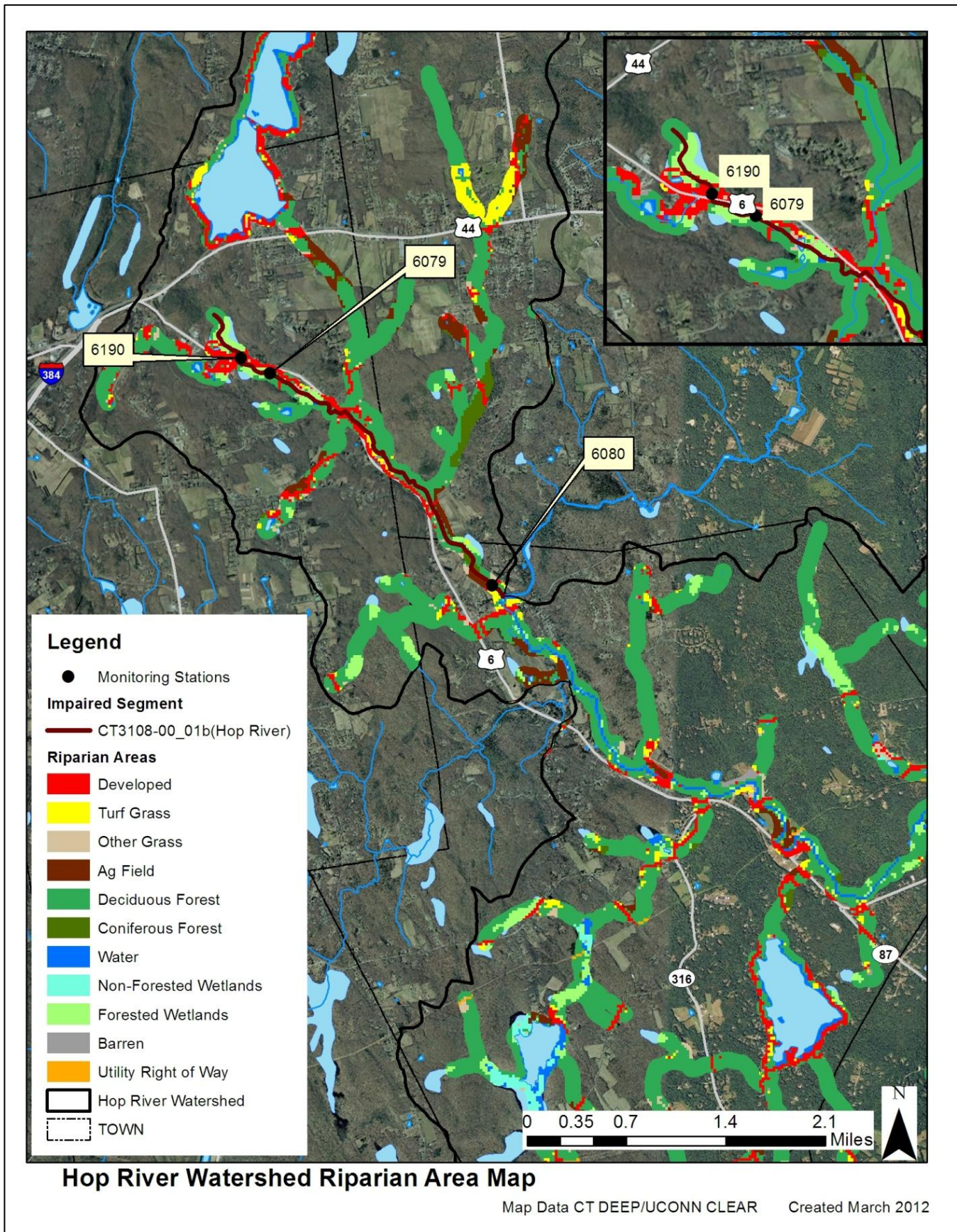
**Land Use/Landscape*****Riparian Buffer Zones***

The riparian buffer zone is the area of land located immediately adjacent to streams, lakes, or other surface waters. The boundary of the riparian zone and the adjoining uplands is gradual and not always well-defined. However, riparian zones differ from the uplands because of high levels of soil moisture, frequent flooding, and the unique assemblage of plant and animal communities found there. Through the interaction of their unique soils, hydrology, and vegetation, natural riparian areas influence water quality as contaminants are taken up into plant tissues, adsorbed onto soil particles, or modified by soil organisms. Any change to the natural riparian buffer zone can reduce the effectiveness of the natural buffer and has the potential to contribute to water quality impairment (USEPA, 2011b).

The CLEAR program at UCONN has created streamside buffer layers for the entire State of Connecticut (<http://clear.uconn.edu/>), which have been used in this TMDL. Analyzing this information can reveal potential sources and implementation opportunities at a localized level. The land use directly adjacent to a waterbody can have direct impacts on water quality from surface runoff.

The majority of the riparian zone of the Hop River is characterized by developed land use along US Route 6 with portions of deciduous forest, forested wetlands, agricultural fields, and turf/grass (Figure 10). As previously noted, waste from unmanaged livestock, pet waste, and septic system malfunction are all likely bacteria sources to the waterbody. Wildlife in non-developed areas can also contribute bacteria to nearby waterbodies, though much of this waste may be treated by natural vegetated buffer.

Figure 10: Riparian buffer zone information for the Hop River watershed



**CURRENT MANAGEMENT ACTIVITIES**

As indicated above, Bolton is regulated under the MS4 program. The MS4 General Permit is required for any municipality with urbanized areas that initiates, creates, originates or maintains any discharge of stormwater from a storm sewer system to waters of the State. The MS4 permit requires towns to design a Stormwater Management Plan (SMP) to reduce the discharge of pollutants in stormwater to improve water quality. The plan must address the following 6 minimum measures:

1. Public Education and Outreach.
2. Public Involvement/Participation.
3. Illicit discharge detection and elimination.
4. Construction site stormwater runoff control.
5. Post-construction stormwater management in the new development and redevelopment.
6. Pollution prevention/good housekeeping for municipal operations.

Each MS4 town is also required to submit an annual update outlining the steps they are taking to meet the six minimum measures. All updates that address bacterial contamination in the watershed are summarized in Table 7.

**Table 7: Summary of MS4 requirement updates related to the reduction of bacterial contamination from Bolton, CT (Permit # GSM000104)**

<b>Minimum Measure</b>	<b>Bolton Annual Report (2010)</b>
Public Outreach and Education	1) Will add stormwater tab to the town website.
Public Involvement and Participation	1) Encouraged residents to participate in the Household Hazardous Waste Program, the Electronics Collection Program, the Recycling Program, and the Bulky Waste Program.
Illicit Discharge Detection and Elimination	1) Will enact new illicit discharge detection and elimination ordinance based on Durham and Waterford models. 2) IDDE manuals made available to Highway Department employees for catch basin cleaning and road sweeping. 3) Will conduct dry-weather MS4 outfall sampling during seasonal low groundwater conditions in Bolton Lake area. 4) Repaired any septic system failures inspected by Eastern Highlands Health District.
Construction Site Stormwater Runoff Control	1) Conducted periodic inspections during road construction for subdivisions and site developments.
Post Construction Stormwater Management	1) Continued to enforce post-construction regulatory mechanism that the rate of post-development peak discharge shall not exceed the pre-development peak discharge for all storm intensities.
Pollution Prevention and Good Housekeeping	1) Conducted sweeping of all town roads. 2) Cleaned 400-450 catch basins and storm manholes along town roads annually.



### RECOMMENDED NEXT STEPS

Bolton has developed and implemented programs to protect water quality from bacterial contamination. Future mitigative activities are necessary to ensure the long-term protection of the Hop River and have been prioritized below.

#### **1) Evaluate municipal education and outreach programs regarding animal waste.**

As most of the Hop River watershed is undeveloped with sections of residential neighborhoods, any education and outreach program should highlight the importance of not feeding waterfowl and wildlife and managing waste from horses, dogs, and other pets. The town and residents can take measures to minimize waterfowl-related impacts such as allowing tall, coarse vegetation to grow in the riparian areas of the Hop River that are frequented by waterfowl. Waterfowl, especially grazers like geese, prefer easy access to water. Maintaining an uncut vegetated buffer along the shore will make the habitat less desirable to geese and encourage migration. In addition, any educational program should emphasize that feeding waterfowl, such as ducks, geese, and swans, may contribute to water quality impairment in the Hop River watershed and can harm human health and the environment. Animal wastes should also be disposed of away from any waterbody or storm drain system. BMPs effective at reducing the impact of animal waste on water quality include installing signage, providing pet waste receptacles in high-use areas, enacting ordinances requiring the clean-up of pet waste, and targeting educational and outreach programs in problem areas.

#### **2) Ensure there are sufficient buffers on agricultural lands along the Hop River.**

There are several identified agricultural fields and cattle farms adjacent to the Hop River and its tributaries. If not already in place, agricultural producers should work with the CT Department of Agriculture and the U.S. Department of Agriculture Natural Resources Conservation Service to develop conservation plans for their farming activities within the watershed. These plans should focus on ensuring that there are sufficient stream buffers, that fencing exists to restrict livestock and horse access to streams and wetlands, and that animal waste handling, disposal, and other appropriate Best Management Practices (BMPs) are in place. Particular attention should be paid to those agricultural operations located within the riparian buffer zone of the Hop River (Figure 10).

#### **3) Develop a system to monitor septic systems.**

All residents of the Hop River watershed rely on septic systems. Bolton has demonstrated an initiative to begin conducting dry-weather MS4 outfall sampling during seasonal low groundwater conditions in the Bolton Lake area. This will help address septic system failures. Bolton also works closely with the Eastern Highlands Health District to repair identified failing septic systems. The watershed towns should continue to ensure that existing septic systems are properly operated and maintained, and maintain an inventory of existing septic systems through mandatory inspections. Inspections help encourage proper maintenance and identify failed and sub-standard systems. Policies that govern the eventual replacement of sub-standard systems within a reasonable timeframe can also be adopted. Towns can develop programs to assist citizens with the replacement and repair of older and failing systems.

**4) Identify areas in the developed sections of the Hop River watershed to implement Best Management Practices (BMPs) to control stormwater runoff.**

As noted previously, 16% of the Hop River watershed is considered urban, and Bolton is an MS4 community regulated by the MS4 program. As such, stormwater runoff is likely contributing bacteria to the waterbody. To identify other areas that are contributing bacteria to the impaired segments, the towns should conduct wet-weather sampling at stormwater outfalls that discharge directly to the impaired segments in the Hop River watershed. Outfalls that show high bacteria concentrations should be prioritized for BMP installation. To treat stormwater runoff, the towns should identify areas along developed sections of the impaired river to install BMPs that encourage stormwater to infiltrate the ground before entering the waterbody. These BMPs would disconnect impervious areas and reduce pollutant loads to the river. More detailed information and BMP recommendations can be found in the core TMDL document.

**5) Expand monitoring of permitted sources.**

There are multiple permitted sources in the Hop River watershed, and several monitored MS4 outfalls have shown consistently high bacterial concentrations. Further monitoring will provide information essential to better locate, understand, and reduce pollution sources. If any current monitoring is not done with appropriate bacterial indicator based on the receiving water, then a recommended change during the next permit reissuance is to include the appropriate indicator species. If facility monitoring indicates elevated bacteria, then implementation of permit required, and voluntary measures to identify and reduce sources of bacterial contamination at the facility are an additional recommendation. Regular monitoring should be established for all permitted sources to ensure compliance with permit requirements and to determine if current requirements are adequate or if additional measures are necessary for water quality protection.

Section 6(k) of the MS4 General Permit requires a municipality to modify their Stormwater Management Plan to implement the TMDL within four months of TMDL approval by EPA if stormwater within the municipality contributes pollutant(s) in excess of the allocation established by the TMDL. For discharges to impaired waterbodies, the municipality must assess and modify the six minimum measures of its plan, if necessary, to meet TMDL standards. Particular focus should be placed on the following plan components: public education, illicit discharge detection and elimination, stormwater structures cleaning, and the repair, upgrade, or retrofit of storm sewer structures. The goal of these modifications is to establish a program that improves water quality consistent with TMDL requirements. Modifications to the Stormwater Management Plan in response to TMDL development should be submitted to the Stormwater Program of DEEP for review and approval.

Table 8 details the appropriate bacteria criteria for use as waste load allocations established by this TMDL for use as water quality targets by permittees as permits are renewed and updated, within the Hop River Watershed.

For any municipality subject to an MS4 permit and affected by a TMDL, the permit requires a modification of the SMP to include BMPs that address the included impairment. In the case of bacteria related impairments municipal BMPs could include: implementation or improvement to existing nuisance wildlife programs, septic system monitoring programs, any additional measures that can be added to the required illicit discharge detection and elimination (IDDE) programs, and increased street sweeping above basic permit requirements. Any non-MS4 municipalities can implement these same types of initiatives in effort to reduce bacteria source loading to impaired waterways.

Any facilities that discharge non-MS4 regulated stormwater should update their Pollution Prevention Plan to reflect BMPs that can reduce bacteria loading to the receiving waterway. These BMPs could include nuisance wildlife control programs and any installations that increase surface infiltration to reduce overall stormwater volumes. Facilities that are regulated under the Commercial Activities Stormwater Permit should report any updates to their SMP in their summary documentation submitted to DEEP.

**Table 8. Bacteria (e.coli) TMDLs, WLAs, and LAs for Recreational Use**

		Instantaneous <i>E. coli</i> (#/100mL)						Geometric Mean <i>E. coli</i> (#/100mL)	
Class	Bacteria Source	WLA <sup>6</sup>			LA <sup>6</sup>			WLA <sup>6</sup>	LA <sup>6</sup>
	Recreational Use	1	2	3	1	2	3	All	All
A	Non-Stormwater NPDES	0	0	0				0	
	CSOs	0	0	0				0	
	SSOs	0	0	0				0	
	Illicit sewer connection	0	0	0				0	
	Leaking sewer lines	0	0	0				0	
	Stormwater (MS4s)	235 <sup>7</sup>	410 <sup>7</sup>	576 <sup>7</sup>				126 <sup>7</sup>	
	Stormwater (non-MS4)				235 <sup>7</sup>	410 <sup>7</sup>	576 <sup>7</sup>		126 <sup>7</sup>
	Wildlife direct discharge				235 <sup>7</sup>	410 <sup>7</sup>	576 <sup>7</sup>		126 <sup>7</sup>
	Human or domestic animal direct discharge <sup>5</sup>				235	410	576		126

- (1) **Designated Swimming.** Procedures for monitoring and closure of bathing areas by State and Local Health Authorities are specified in: Guidelines for Monitoring Bathing Waters and Closure Protocol, adopted jointly by the Department of Environmental Protections and the Department of Public Health. May 1989. Revised April 2003 and updated December 2008.
- (2) **Non-Designated Swimming.** Includes areas otherwise suitable for swimming but which have not been designated by State or Local authorities as bathing areas, waters which support tubing, water skiing, or other recreational activities where full body contact is likely.
- (3) **All Other Recreational Uses.**
- (4) Criteria for the protection of recreational uses in Class B waters do not apply when disinfection of sewage treatment plant effluents is not required consistent with Standard 23. (Class B surface waters located north of Interstate Highway I-95 and downstream of a sewage treatment plant providing seasonal disinfection May 1 through October 1, as authorized by the Commissioner.)
- (5) Human direct discharge = swimmers
- (6) Unless otherwise required by statute or regulation, compliance with this TMDL will be based on ambient concentrations and not end-of-pipe bacteria concentrations
- (7) Replace numeric value with "natural levels" if only source is naturally occurring wildlife. Natural is defined as the biological, chemical and physical conditions and communities that occur within the environment which are unaffected or minimally affected by human influences (CT DEEP 2011a). Sections 2.2.2 and 6.2.7 of this Core Document deal with BMPs and delineating type of wildlife inputs.



**BACTERIA DATA AND PERCENT REDUCTIONS TO MEET THE TMDL****Table 9: Hop River Bacteria Data**

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**Waterbody ID:** CT3108-00\_01b

**Characteristics:** Freshwater, Class A, Potential Drinking Water Supplies, Habitat for Fish and Other Aquatic Life and Wildlife, Recreation, Navigation, and Industrial and Agricultural Water Supply

**Impairment:** Recreation (*E. coli* bacteria)

**Water Quality Criteria for *E. coli*:**

Geometric Mean: 126 colonies/100 mL

Single Sample: 410 colonies/100 mL

**Percent Reduction to meet TMDL:**

Geometric Mean: **32%**

Single Sample: **29%**

**Data:** 2010 from CT DEEP targeted sampling efforts, 2012 TMDL Cycle

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Single sample data from all monitoring stations on the Hop River with annual geometric means calculated

Station Name	Station Location	Date	Result	Wet/Dry	Geomean
6080	At Times Farm Road crossing	5/5/2010	52	dry	<b>184* (32%)</b>
6080	At Times Farm Road crossing	5/11/2010	20	dry	
6080	At Times Farm Road crossing	5/18/2010	41	wet	
6080	At Times Farm Road crossing	5/25/2010	190	dry	
6080	At Times Farm Road crossing	6/1/2010	280	wet	
6080	At Times Farm Road crossing	6/8/2010	110	dry	
6080	At Times Farm Road crossing	6/15/2010	240	dry	
6080	At Times Farm Road crossing	6/22/2010	270	wet	
6080	At Times Farm Road crossing	6/29/2010	200	dry	
6080	At Times Farm Road crossing	7/6/2010	300	dry	
6080	At Times Farm Road crossing	7/13/2010	450	wet	
6080	At Times Farm Road crossing	7/20/2010	<b>580* (29%)</b>	dry	
6080	At Times Farm Road crossing	7/27/2010	310	dry	
6080	At Times Farm Road crossing	8/3/2010	190	dry	
6080	At Times Farm Road crossing	8/10/2010	180	dry	
6080	At Times Farm Road crossing	8/17/2010	510	dry	
6080	At Times Farm Road crossing	8/24/2010	500	dry	
6080	At Times Farm Road crossing	8/31/2010	120	dry	
6080	At Times Farm Road crossing	9/7/2010	110	dry	
6080	At Times Farm Road crossing	9/14/2010	240	dry	
6080	At Times Farm Road crossing	9/21/2010	235 <sup>†</sup>	dry	
6080	At Times Farm Road crossing	9/28/2010	135 <sup>†</sup>	wet	
6190	Route 6 crossing adjacent to Stony Road	9/14/2010	15 <sup>†</sup>	dry	12
6190	Route 6 crossing adjacent to Stony Road	9/21/2010	10	dry	
6079	Above Johnson Pond adjacent to Johnson Road and Route 6	9/21/2010	10	dry	NA

Shaded cells indicate an exceedance of water quality criteria

<sup>†</sup> Average of two duplicate samples

\*\* Weather conditions for selected data taken from Hartford because local station had missing data

\*Indicates single sample and geometric mean values used to calculate the percent reduction

**Wet and dry weather *E. coli* (colonies/100 mL) geometric mean values for all monitoring stations on the Hop River**

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
6080	At Times Farm Road crossing	2010	5	17	184	180	186
6079	Adjacent to Johnson Road and Route 6	2010	0	1	10	NA	NA
6190	Route 6 crossing adjacent to Stony Road	2010	0	2	12	NA	12
Shaded cells indicate an exceedance of water quality criteria							
Weather condition determined from rain gages at Hartford Bradley International Airport, CT.							



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